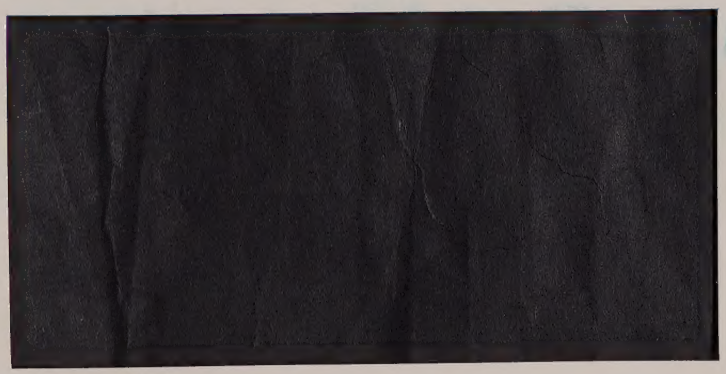
08322

ASSOCIATED ENVIRONMENTAL SYSTEMS



BHD-408

MP MASTER
MA33098

INSTRUCTION MANUAL

BHD-408

BENCH-TOP TEMPERATURE & HUMIDITY TEST CHAMBER

INSTALLATION

OPERATION

MAINTENANCE

ASSOCIATED
ENVIRONMENTAL SYSTEMS
DIVISON OF
CRAIG SYSTEMS CORP
10 INDUSTRIAL WAY, P.O. BOX 648, AMESBURY, MASSACHUSETTS 01913-4848
(617) 388-5662

Digitized by the Internet Archive
in 2026

https://archive.org/details/manualsplus_12182

CONTENTS

	PAGE NO.
SECTION I - DESCRIPTION.....	1
SECTION II - INSTALLATION.....	3
- Location	3
- Electrical Connections.....	3
- Water Connections.....	3
- Condensate Drain.....	4
SECTION III- OPERATION.....	6
- Control Instruments.....	6
- Testing Procedure.....	8
SECTION IV - MAINTENANCE.....	11

APPENDIX I - Operation and Tuning Temperature Controller

II - Operation and Tuning the % RH Controller

III - Electrical Wiring Schematic and Parts List

IV - Refrigeration Plumbing Schematic and Parts List

V - Humidity Piping Schematic to Include Optional Demineralizer

VI - Chamber Parts List

VII - Relative Humidity Tables

VIII - Warranty

SECTION I

DESCRIPTION

The BHD-408 is a semi-portable bench-top environmental test chamber that can simulate precise high-low temperature or temperature-humidity conditions. The chamber specifications are as follows:

DIMENSIONS:

Interior: 24 H x 24 W x 24 D inches (61x61x61 cm)
Exterior: 32 H x 55 W x 36 D inches (81x140x91 cm)

TEMPERATURE RANGE:

0°F (-17.8°C) to +200°F (93°C)

TEMPERATURE CONTROL STABILITY:

± 1/2°F

HUMIDITY RANGE:

20% to 98% ± 5% RH within the Dry Bulb Temperature range of +35°F (1.67°C) to +185°F (85°C) limited by a +35°F (1.67°C) Dew Point Temperature.

HUMIDITY CONTROL STABILITY:

± 5° RH

POWER REQUIREMENTS:

115 VAC, 1-Phase, 60 HZ, 16 amps (standard)
100 VAC, 1-Phase, 50 HZ, 16 amps (optional)

WATER REQUIREMENTS:

Maximum water consumption of the vapor generator is approximately 6 quarts (5.68 liters) per 24 hours.

REFRIGERATION SYSTEM:

Consists of a hermetically sealed refrigeration system with air-cooled condenser.

HEATING SYSTEM:

Electric resistance heating elements

HUMIDIFICATION SYSTEM:

This consists of an atmospheric vapor generator.

INSTRUMENTATION:

Solid-state 'three-mode' dry bulb temperature and relative humidity controllers with digital displays and settings.

SAFETY FEATURES:

(1) High temperature failsafe (P/N 86607) protects chamber
(2) High temperature 'heat limiter' (P/N 85640) fuse in series with heaters.
(3) Vapor generator failsafe (P/N 86608)
(4) Freeze protector (P/N 86607) on wet wick tank and humidity system.

OPERATING ENVIRONMENT:

+60°F to +90°F
(15.6 to 32.2°C)

TEST ITEMS:

Items to be tested should occupy no more than one-third of the chamber's volume.

SECTION II

INSTALLATION

INSPECTION:

Inspect the chamber for obvious shipping or handling damage.

IMPORTANT:

A fiberboard has been taped over the condenser coil in the rear of the chamber to protect the coil fins during shipment. THIS BOARD MUST BE REMOVED BEFORE THE CHAMBER CAN BE PUT INTO OPERATION.

LOCATION:

Place the chamber on a level bench top in a well ventilated area having an ambient air temperature of +60°F (+15.6°C) to +90°F (+32.2°C). Allow at least 12 inches (30 cm) of unobstructed space around the rear and the left side of the chamber so that air may flow freely through the air-cooled condenser. Also leave enough room for the right-hinged door to swing open.

ELECTRICAL CONNECTION:

Connect the chamber power cord to a three-wire type grounded outlet capable of meeting the chamber's power requirement. The chamber should be adequately fused or have a circuit breaker according to NEC or any other applicable electrical wiring standards. The specific power requirements for the chamber are stated on the identification label located on back of the chamber. Efficiency and performance of the chamber will be severely affected unless the input power requirements are met.

WATER CONNECTIONS:

A reservoir with float valve feeds water to the vapor generator and the wet wick tank. The water source should be connected to the shut off valve located externally at the rear of the chamber. A water strainer and pressure regulator are connected between the shutoff valve and the float valve. The regulator has been factory adjusted to deliver water at 15 PSIG.

IMPORTANT:

It is recommended that a demineralized or distilled water source should be used. If a piped water source is not available, an optional external water storage tank can be purchased.

DEMINERALIZER SYSTEM OPTION:

The system can take in water containing high amounts of minerals and purify it to a distilled grade water, thereby eliminating the need for expensive distilled or de-ionized water source. The demineralizer cartridge is shipped loose and must be installed before placing the chamber in operation (See Fig. 3).

CONDENSATE DRAIN:

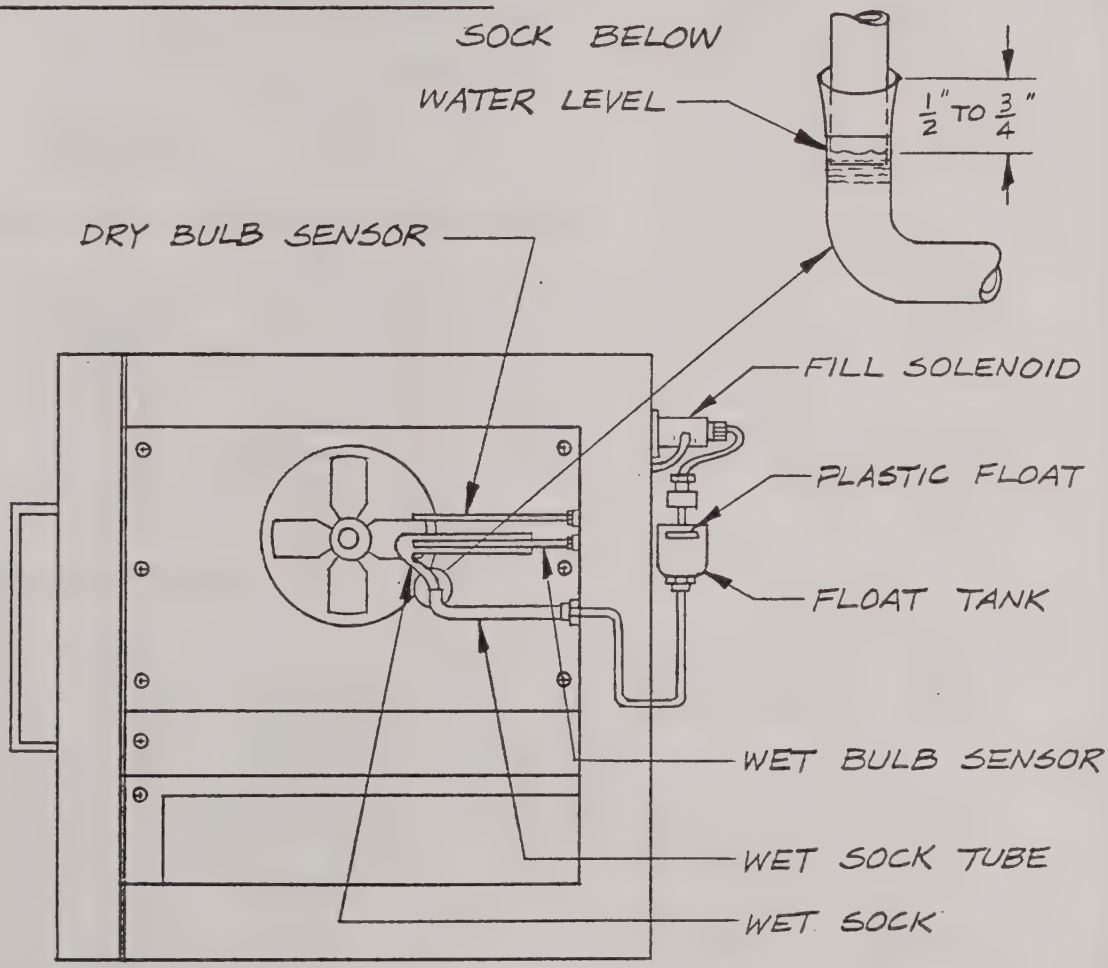
This chamber has been provided with a gravity flow condensate drain. The amount of condensate is normally small and can be collected in a bucket.

CAUTION: DO NOT PLUG THE DRAIN CONNECTION. IT MUST BE OPEN AT ALL TIMES FOR PROPER FUNCTIONING OF THE CHAMBER.

WATER RECIRCULATING SYSTEM OPTION:

This consists of a large plastic water tank located on top of the chamber. This tank supplies water to the generator float tank and the wet wick tank. All drains are connected to the sump of a condensate pump located on the chamber base. If a good quality water source is available, connect it to the inlet valve on the back of the chamber. Otherwise, for system start-up distilled water may be poured directly into the storage tank. When enough condensate collects in the sump of the condensate pump, it is automatically pumped back to the storage tank. Add make-up water to the storage tank for evaporation losses, etc., as required.

WET SOCK INSTALLATION



The open end of the wet sock must be placed over the wet bulb sensor. The other end of the wet sock must be pushed into the water in the wet sock tube. The water should be 1/2" to 3/4" below the top of the wet sock tube. The water level can be adjusted by bending the arm of the plastic flow in the brass tank on the back of the chamber.

Chambers with the optional control and/or recording systems will have additional sensors. (Some systems will require two sensors to be covered by wet socks).

SECTION III

OPERATION

CONTROL INSTRUMENTS:

STANDARD DRY BULB TEMPERATURE CONTROLLER:

1. The standard controller, Part Number 86570, is a microprocessor based, digital indicating, 3-mode (proportional plus automatic reset and rate) controller. The tuning parameters have been factory adjusted for the no-load condition, however Appendix I describes the procedures for adjusting the parameters for optimum control at any load condition. This controller may be remotely set by the optional programmers or interfaces. Separate manuals will be provided with those options.

2. STANDARD DIRECT % RH CONTROLLER

   The Standard Controller, Part Number 86637, is a relative humidity controller that offers a primary output to control humidity and a secondary output to provide dehumidification control. It features a digital readout that displays the process RH or the setpoint when called for. The 86637 Controller utilizes a thermistor sensor for dry bulb temperature compensation and a differential type "E" thermocouple for a humidity sensor. See Appendix II for adjustment and tuning.

3, A programmer and/or a recorder can be obtained as options on this chamber.

FUNCTION SWITCHES: The following switches are located on the control panel:

1. CIRCULATION - Serves as primary power ON/OFF switch for the chamber and also turns ON/OFF circulation fan motor.

2. HEAT - Serves as ON/OFF switch for chamber's heating system.

3. MECH. REFRIGERATION - Serves as ON/OFF switch for refrigeration cooling system.

4. DEHUMIDITY - Turns ON/OFF vapor generator for humidification.

5. HUMIDITY - Turns ON/OFF vapor generator for humidification.

6. MANUAL/PROGRAM (OPTIONAL)- Allows operator to choose either manual control or programmer control of the chamber temperature/ humidity.

7. LIGHT (OPTIONAL)- Serves as the ON/OFF switch for the optional light which illuminates the test compartment.

HUMIDITY SYSTEM FREEZE PROTECTION: The wick for the wet bulb sensor is immersed in a small reservoir inside the chamber. The Freeze Protection Control automatically drains the reservoirs and turns the vapor generator OFF at temperatures below +35°F (1.67°C).

VAPOR GENERATOR FAIL-SAFE: This Fail-safe turns power OFF to the generator heaters in case of low water level or no water, thus preventing burnout of heaters.

HIGH TEMPERATURE FAILSAFE: This control provides protection against the possibility of a high temperature runaway in the event of a control instrument failure or any similar circumstance which would cause the chamber temperature to be driven beyond the set point. The Failsafe has been factory set at a temperature of 10°F above the maximum operating temperature of the chamber The failsafe is adjustable to provide protection within the range of room temperature to the upper design limit of the chamber. The failsafe set temperature is increased by rotating the control counter-clockwise and is decreased by rotating the control clockwise. The following is the recommended procedure for resetting the failsafe:

Step 1 - Dial the dry bulb temperature selector to a setting of approximately 10°F above the temperature that you do not want the chamber to exceed.

Step 2 - Place the CIRCULATION and HEAT switches ON. If a manual/program switch is on the chamber, flip it to the manual position.

Step 3 - After the chamber temperature has reached the set point, allow approximately 15 minutes for stabilization.

Step 4 - Adjust the FAILSAFE control slowly in the clockwise direction to the point where the failsafe pilot light just comes ON.

Step 5 - Suitable high temperature protection has now been established.

PILOT LIGHTS: These have been provided to help monitor functioning of various equipment. The lights are lit when indicated system is operating.

TESTING PROCEDURES:

This chamber offers several methods for simulating various types of temperature and humidity environments. Among these types are:

(1). Maintain temperature constant (humidity uncontrolled) (standard).

(2) Maintain temperature and humidity constant (standard)

(3) Programmed temperature cycling (humidity uncontrolled) (optional).

(4) Maintain humidity constant with programmed temperature cycling (optional).

(5) Maintain temperature constant with programmed humidity cycling (optional).

(6) Programmed cycling of temperature and humidity (optional).

(A) CONSTANT TEMPERATURE AND/OR CONSTANT HUMIDITY OPERATION

For constant temperature and/or humidity conditions, adjust the appropriate controller (see Appendix I and II) for the desired temperature and/or humidity.

CAUTION: On chambers with an optional programmer, place the manual/program switch in the manual position.

Load chamber with test items.

CAUTION: Make sure the test items occupy no more than one-third of the chamber's volume to ensure proper operation of chamber.

Then for constant temperature only, place the following switches ON:

(1) Circulation
(2) Mech. Refrig.
(3) Heat

For constant temperature and humidity, place the following switches ON:

(1) Circulation
(2) Mech. Refrig.
(3) Heat
(4) Dehumidity
(5) Humidity.

(B) PROGRAMMED OPERATION (OPTIONAL)

Place the manual program switch in the program position.

Follow the programmer manual's operating instructions.

For temperature cycling only, turn the following switches ON:

(1) Circulation
(2) Mech. Refrig.
(3) Heat

For both temperature and humidity controlled environments, turn the following switches ON:

(1) Circulation
(2) Mech. Refrig.
(3) Heat
(4) Dehumidity
(5) Humidity

CAUTION: In loading the test items into the chamber, make sure they occupy no more than one-third of the chamber's volume.

VENTING:

When the chamber is being operated with the humidity system ON, make sure that the 3/4" diameter vent port is unplugged. If this port is plugged, there will be a pressure buildup inside of the chamber which will severely hamper the humidification process.

SECTION IV

MAINTENANCE

CHAMBER: The inner chamber is constructed of stainless steel with heliarc welded seams and joints to make it vaportight. If it becomes necessary to drill holes through the inner chamber for the purpose of fastening a test piece, etc., such holes must be very carefully sealed with a silicone base compound capable of sustaining the temperature and humidity extremes generated within the chamber.

DOOR GASKET: The door gasket may require replacement periodically. This gasket is made from a special type silicone rubber for the extreme temperature and humidity conditions.

HEAT CIRCUIT: A heat limiter fuse has been provided in the heat circuit as a safety device which opens in the event of high temperature runaway due to abnormal conditions. This fuse is located inside the chamber plenum. Under no circumstances should this fuse be shorted out or repaired. Replace with an identical fuse ONLY.

REFRIGERATION UNIT: This has been provided with an air-cooled condenser which must be kept clean from dust and lint. This can be done by a vacuum cleaner or compressed air. The condenser fan motor should be lubricated with two or three drops of 'SAE 20' non-detergent automotive oil once every three months, or less frequently with intermittent operation.

HUMIDIFIER: The water supply line to the chamber has an in-line water strainer with a 100 mesh screen element. This element should be kept clean by washing with tap water. The float valve reservoir and the wet wick reservoir must be kept free from dirt by wiping them clean. Check the wet wick regularly and replace when it becomes hardened or does not readily absorb water. The heater elements in the vapor generator must be replaced with identical units ONLY when necessary.

OPTIONAL DEMINERALIZER: This chamber is equipped with a pressure type demineralizer cartridge which must be replaced when the color change extends to within two inches of the bottom.

INSTRUCTIONS FOR OPTIONAL EQUIPMENT

This chamber may be provided with one or more of the optional features which enable the unit to operate unattended for prolonged periods of time. The following instructions should be used to place the additional equipment into operation.

EXTERNAL WATER STORAGE TANK

External water storage tank must be located at an elevation higher than the chamber top because water flows to the chamber by gravity. Connection should be made from the tank to the inlet side of the float valve in the small brass tank located at the rear of the chamber. A piece of nylon tubing with shut-off valve has been provided.

WATER CONDENSATE PUMP

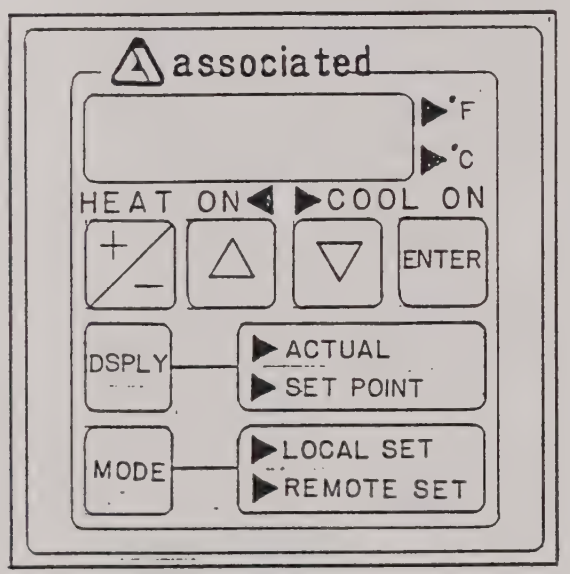
This should be placed under the bench on which the chamber is to be located. It has been provided with a 3/8" OD nylon condensate return line which must be connected to the INLET (top connection) on the water storage tank. A 3/8" OD nylon drain line must be connected to the chamber drain (located at the rear of the chamber). The other end of this drain line should be inserted into the opening provided in the condensate pump reservoir. The pump has a line cord with a connector at one end. This should be plugged into the mating connector provided on rear of the chamber.

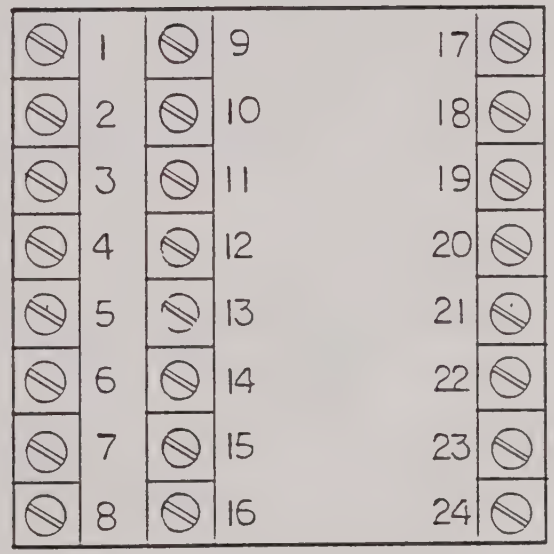
APPENDIX I

APPENDIX I

OPERATING AND TUNING THE DIGITAL TEMPERATURE

CONTROLLER #85670





B. General Description

This is a 3-mode controller with proportional plus automatic reset and rate control with the following adjustable tuning parameters for both heat and cool outputs:

Proportional Band: 0 to 100°C or 0 to 180°F
Cycle Time: 1-6 seconds
Rate: 0 to 1 minute in hundredths of minutes.
Auto Reset: 0 to 100 repeats per minute in hundredths.

In addition, there is an adjustable dead band between heating and cooling of 0-6°C or 0-10°F. The rate band is internally set at two proportional bands above and below the set point.

The controller accepts an input from a 100 ohm (at 0°C) platinum RTD conforming to DIN 43760 (138.50 ohms at 100°C). An open RTD is indicated by four dashes (----) on the display and will disable the heating and cooling outputs.

Electrical connections to the controller are shown on the electrical schematic for the particular chamber in use. The following lists the terminals and their uses:

1. S1 (RTD1)
2. NOT USED
3. S2 (RTD2)
4. SP+ (REMOTE PROGRAM PLUS, 5 mV/DEGREE INPUT)
5. S3 (RTD3) Note: Jumper RTD2 to RTD3 if using a 2-wire RTD.
6. NOT USED
7. NOT USED
8. SP- (REMOTE PROGRAM COMMON)
9. SC- (SIGNAL CONDITIONER COMMON)
10. NOT USED
11. NOT USED
12. SC+ (SIGNAL CONDITIONER PLUS, 5 mV/DEGREE OUTPUT)
13. NOT USED
14. COM (COOLING OUTPUTS, 1 AMP TRIAC)
15. NOT USED
16. N.O. (COOLING OUTPUTS, 1 AMP TRIAC)
17. L1A (L1, FOR 115 VAC JUMPER 1A TO L1B)
18. L2A (L2, FOR 115 V AC JUMPER L2A TO L2B)
19. L1B
20. L2B
21. EARTH GROUND
22. O.C. (HEATING OUTPUT, DC TRIGGER)
23. +20 VDC (HEATING OUTPUT, DC TRIGGER0
24. COM NOT USED

C. Operation in Local Set Mode

Push the MODE key to place the controller in the Local Set Mode. Push the DISPLAY key to change the displayed value to the Set Point. Push the +/-key and the △ and ▽ keys to display the desired temperature set point which will flash on the display. Push the ENTER key to enter this set point at which time the controller will start to control the chamber to the new set point. Push the DISPLAY key to display the actual temperature.

The red arrow shaped LED's indicate the active state of the controller. Flashing HEAT ON or COOL ON arrows indicate that the chamber temperature is being controlled with the proportioning band.

D. Operation in Remote Set Mode

If the chamber is equipped with a remote programmer or interface, push the MODE key to place the controller in the Remote Set Mode. Only the actual temperature will be displayed when the controller is in the Remote Set Mode.

Refer to the separate Programmer or Interface Manual for instructions on controlling the chamber temperature while in the Remote Mode.

E. Tuning the Controller

This controller was configured and tuned in the factory for the particular chamber. Though the information is provided below, it is extremely important that the high and low temperature ranges as specified for the particular not be exceeded. Raising the high limit and operating the chamber above the specified maximum temperature could damage the chamber and even injure an operator. Reducing the low limit will have little effect on the chamber since the mechanical refrigeration system has a minimum evaporator temperature.

With the controller pulled part way out of the panel cut-out a four-switch dip switch will be visible through a slot in the top of the controller case. CAUTION: EXERCISE PRUDENT CARE WHEN WORKING IN THE ELECTRICAL ENCLOSURE OF THE CHAMBER TO AVOID ELECTRICAL SHOCKS OR DAMAGE TO COMPONENTS.

DIP SWITCH CONFIGURATION CHART

DIP SWITCH 1 2 3 4	FUNCTION
DN DN DN DN	Normal Operation degrees Celsius
DN DN DN DN	Normal Operation degrees Fahrenheit
DN DN UP UP	Display/Adjust Dead Band °C (0-6°C)
DN DN UP UP	Display/Adjust Dead Band °F (0-10°F)
DN UP DN DN	Display/Adjust Cycle Time °C (1-6 sec)
DN UP DN UP	Display/Adjust Cycle Time °F (1-6 sec)
DN UP UP DN	Display/Adjust High Range °C (-184 to 537°C)
DN UP UP UP	Display/Adjust High Range °F (-300 to 999°F)
UP DN DN DN	Display/Adjust Rate °C (0-100 hundredths of a minute)
UP DN DN UP	Display/Adjust Rate °F (0-100 hundredths of a minute)
UP DN UP DN	Display/Adjust Low Range °C (-184 to 537°C)
UP DN UP UP	Display/Adjust Low Range °F (-300 to 999°F)
UP UP DN DN	Display/Adjust Reset °C (0-100 hundredth repeats/minute)
UP UP DN UP	Display/Adjust Reset °F (0-100 hundredth repeats/minute)
UP UP UP DN	Display/Adjust Proportional Band °C (0-100°C)
UP UP UP UP	Display/Adjust Proportional Bank °F (0-180°F)

DN = DOWN, UP = UP

To adjust any of the control parameters use the following procedure:

1. Place the dip switches in the appropriate configuration for the parameter.

2. Push the DSPLY key to activate the Set Point Arrow LED.

3. Push the +/-, △ or ▽ keys to display the desired parameter setting.

4. Push the ENTER key to enter the setting.

After all adjustments return the dip switches to the appropriate Normal Operation configuration.

The controller and chamber were tuned in the factory for optimum no load response. Under loaded conditions the system will respond differently. Dead loads (mass) will increase the system response time. Live load (heat input) will decrease the heating response time but increase the cooling response time.

The following procedure outlines the adjustments for 3-mode control:

1. Initially set the controls as indicated:

   Cycle time: 2 seconds
   Proportional Band: 10°C or 18°F
   Rate: 0
   Reset: 5 hundredths repeats/minute
   Dead Band: 0°

2. Proportional Band Adjustment:

   Decrease the proportional band 1-2 degrees and observe the system stability. Repeat until the actual temperature begins to hunt (becomes unstable). When hunting is observed, increase the proportional band until the system is stable enough to allow minimum proportional band.

3. Rate Adjustment

   The rate adjustment controls overshoot as actual temperature approaches set point temperature by limiting the rate of change of actual temperature. Increase the rate 5-10 hundredths of a minute. Change the set point temperature 20 to 30°F/°%C and observe the approach to set point. If the actual temperature overshoots, repeat the procedure until optimum approach to set point is achieved. If the rate is advanced too far, the system will be overdamped and approach to set point will be very sluggish.

4. Reset Adjustment

The reset adjustment controls the time required to drive the error signal to zero. A slow setting (.05 repeats/mins.) requires long periods of time for the actual temperature to reach set point. If the reset time is set too fast (.5 repeats/mins.) the system may become unstable and oscillate about set point temperature. To adjust reset time, increase 5-10 hundredths repeats/minute and observe stability. Continue adjusting until the system becomes unstable. Reduce the reset very slowly to regain stability.

5. Cycle Time

Cycle time is the time base used in proportioning power to the load. At a setting of 2 seconds, if 25% power is required to maintain actual temperature at set point, power will be applied for 1/2 second every 2 seconds. Best control is always achieved with faster cycle times. However, if a mechanical contactor or a solenoid is used to switch power to the load, slower cycle times may be desirable to minimize the wear on the mechanical components.

6. Dead Band

A dead band is only required for inherently unstable systems or for certain heating situations where cycling of the cooling system is objectionable. This may be the case when only CO2 or LN2 is available and the cost savings from minimum use of the CO2 or LN2 outweigh the slight loss of control. Increase the deadband 2° at a time until a satisfactory operating state is achieved.

APPENDIX II

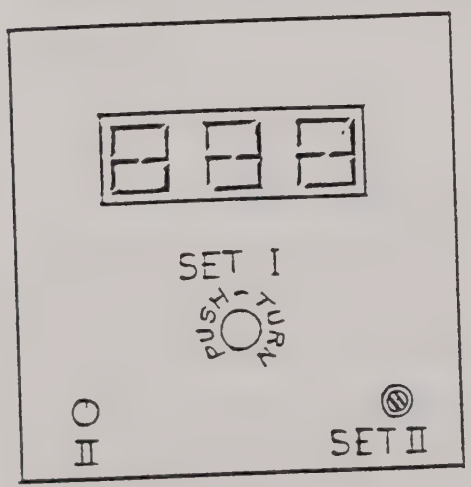
APPENDIX II

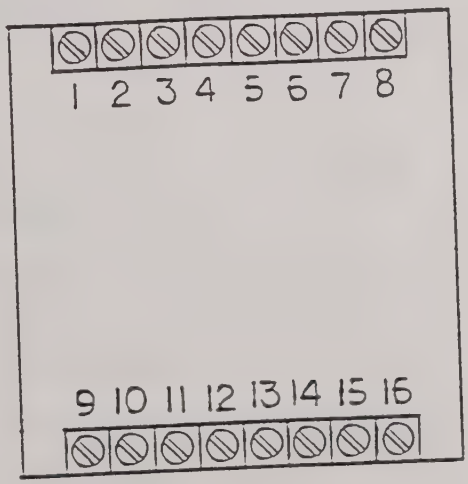
OPERATING AND TUNING THE DIGITAL DIRECT READING

% RH CONTROLLER #86637

A. SCOPE

This instruction applies to digital readout direct reading % RH Controller, Associated Part No. 86637.





B. OPERATING CONTROLLER

In order for the RH Controller to be operative, the circulation and humidity must be turned on.

Power to chamber must be on. Put circulation switch to ON position. Put humidity switch to ON position. Controller now displays actual humidity in chamber .

To see what the setting is, push "Set I" button IN. The controller now displays the set % RH.

To increase setting with button pushed in, turn clockwise until desired setting is displayed. Likewise, turning button counterclockwise decreases setting.

Releasing button returns display to actual % RH.

Refer to specification sheet in front of manual for proper temperature and % RH range for chamber.

c. TUNING

1. Initially set the control as indicated:

   A. Humidify and De-Humidify Cycle time: (maximum CCW). (Minimum - 2 seconds).

   B. Humidify and De-Humidify Proportional Band: (maximum CW). (MAX).

   C. Rate: (maximum CCW). (Min. Rate)

   D. Reset: (maximum CW). (.05 Repeats) (Min. Reset).

   E. Set II (Dead Band): (Maximum CCW). (Min. dead band).

2. Proportional Band Adjustment:

   2.1 De-Humidify PB Adjustment:

      2.1.1 Disable humidify function by disconnecting moisture source.

      2.1.2 Adjust Set I for the most commonly used De-Humidify RH.

2.1.3 Rotate the proportional band pot CCW 1/4 turn and observe the system stability. Repeat until the load dehumidity begins to hunt. When hunting is observed, rotate slowly CW until the system may be stable enough to allow minimum proportional band (maximum CCW).

2.2 Humidify PB Adjustment:

2.2.1 Disable De-Humidify function.

2.2.2 Adjust Set I for the most commonly used Humidify RH.

2.2.3 Rotate the proportional band pot CCW 1/4 turn and observe the system stability. Repeat until the load humidify begins to hunt. When hunting is observed, rotate slowly CW until the system may be stable enough to allow minimum proportional band (maximum CCW).

2.3 Humidify and De-Humidify Combined PB Adjustment

2.3.1 Enable both Humidify and De-Humidify functions.

2.3.2 Adjust Set I for the most commonly used Humidify and De-Humidify RH settings. Fine tuning of the PB adjustments per 2.1.3 and 2.2.3 may be necessary if hunting occurs on either Humidify or De-Humidify.

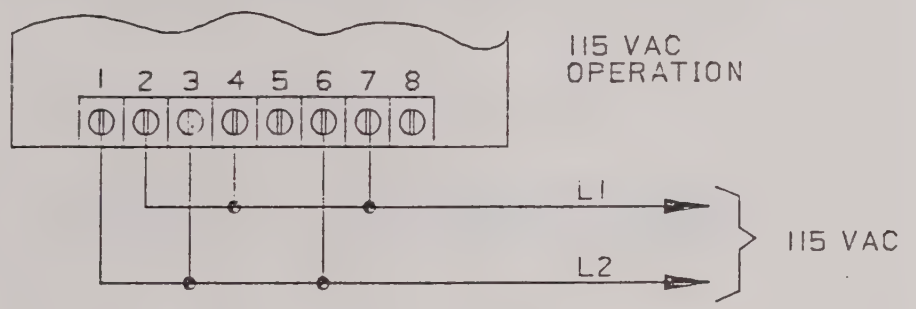
3. Rate Adjustment:

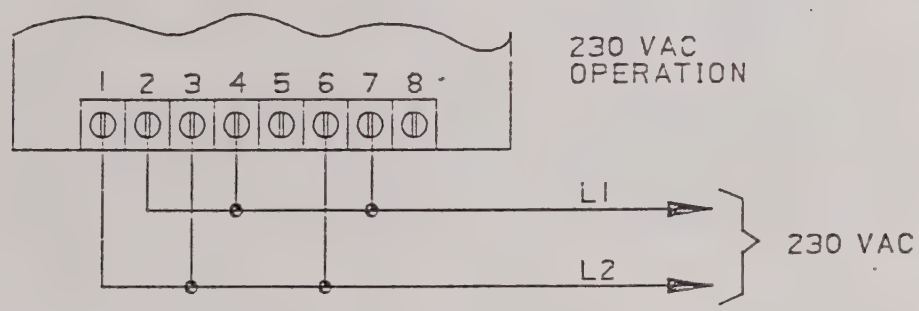
3.1 Rotate the rate pot 1/4 turn CW.

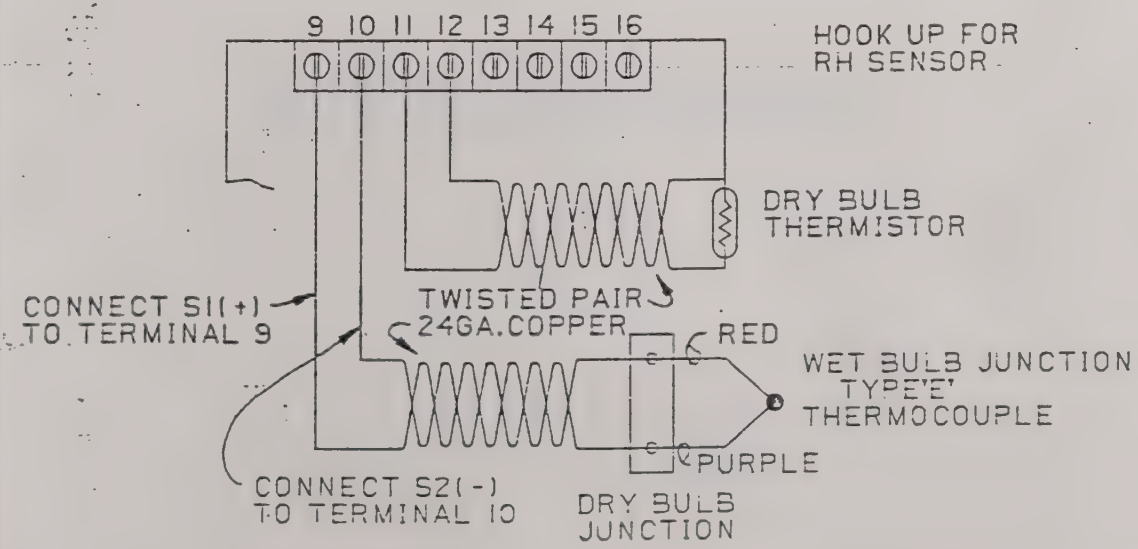
3/2 Increase the set point 20 to 30% RH, and observe the approach to set point. Decrease the set point 20 to 30% RH, and observe the approach to set point.

All PID settings should be made at nominal RH settings. The PID settings may require fine tuning when operating at different RH. The same PID settings will work in all identical environmental chambers, once the optimum PID settings have been established.

D. ELECTRICAL CONNECTIONS





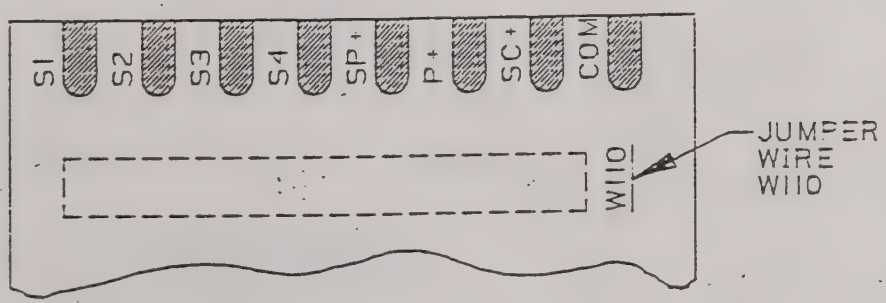


ELECTRICAL CONNECTIONS CONT.

TERMINALS 9 THRU 16

WARNING: IF USING PROGRAMMER INPUT, REMOVE "INTERNAL JUMPER" WIRE SEE BELOW.

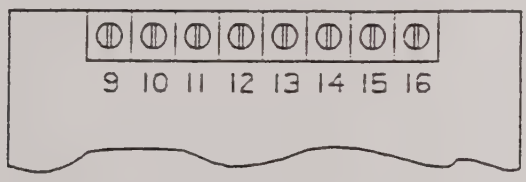
INSTRUCTIONS: WHEN USING PROGRAMMER INPUT; PULL THE UNIT OUT OF ITS' CASE. TURN THE UNIT OVER SO THE FRONT PANEL IS FACING AWAY AND THE BOTTOM SIDE OF THE BOARD IS VUSIBLE. REMOVE JUMPER WIRE W110. SEE DIAGRAM BELOW FOR EXACT LOCATION OF JUMPER WIRE.



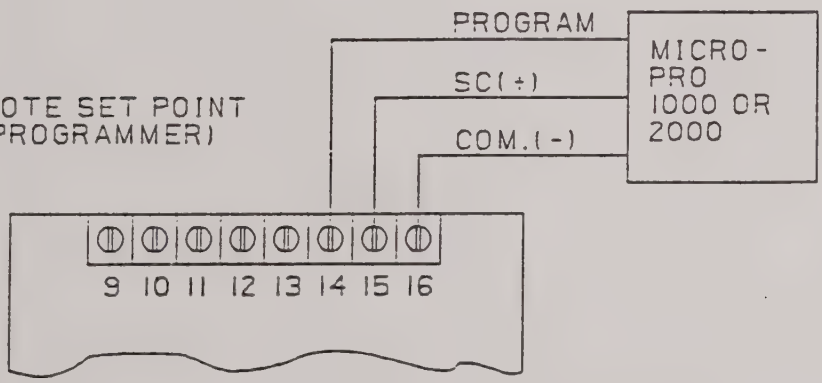
IF USING PROGRAMMER INPUT REMOVE W110

ELECTRICAL CONNECTIONS CONT.

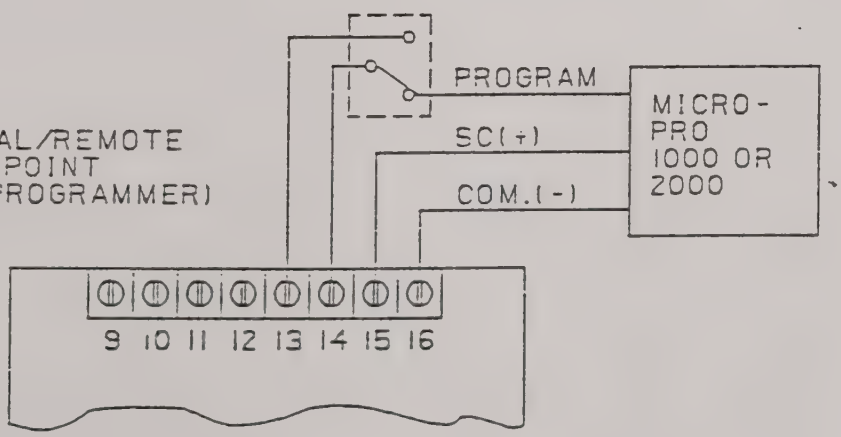
LOCAL SET POINT
(NEED ONLY TO HOOK UP
SENSOR SEE ABOVE)



REMOTE SET POINT
(W/PROGRAMMER)



LOCAL/REMOTE
SET POINT
(W/PROGRAMMER)



APPENDIX III

DWN	REV.
DATE	ECN
CKD	BY
DATE	DATE
APVD	APVD
DATE	DATE

ASSOCIATED ENVIRONMENTAL SYSTEMS

SUBSIDIARY OF KIDDE, INC.

KIDDE AMESBURY, MA

PL 107029

TITLE ELECTRICAL SCHEMATIC

MODEL BHD-408

ITEM NO.	SIZE	PART NO.	QTY	PART NAME/DESCRIPTION	CL
		85550	1	Pilot (Optional)	
		85583	1	Lamp, 60W	
		85585	1	Light Assembly	
		85750	1	Circ Motor	
		85548	1	Relay, 1P1T, K-F	
		86608	1	Controller (Vapor Generator Failsafe)	
		86572	2	Thermocouple Type 'J'	
		85078	2	Fill-Sol, Drain-Sol	
		86569	2	Thermocouple Type 'T'	
		86607	2	Controller (High Temp Failsafe, Freeze Failsafe)	
		86570	1	Controller (Temperature)	
		86595	1	Sensor	
		85513	1	Reset SW	
		80649	3	Relay	
		80467	1	Thermocouple	
		80450	1	Thermistor	
		86637	1	Controller (Humidity)	
		85871	1	Fuse, 1A F-99	
		81049	1	Fuse, 2/10A F-1A	
		85731	1	Wiring Com Receptacle	
		85730	1	4 Pin Connector	
		85623	1	Heater, 1000W, 120V	

ENR	DATE	CODE IDENT NO. 81902	W.O. NO.	PL

DWN	REV.
DATE	ECN
CKD	BY
DATE	DATE
APVD	APVD
DATE	DATE

ASSOCIATED ENVIRONMENTAL SYSTEMS

SUBSIDIARY OF KIDDE, INC.

KIDDE AMESBURY. MA

PAGE____ OF____

PL

TITLE

MODEL BHD-408

ITEM NO.	SIZE	PART NO.	QTY	PART NAME/DESCRIPTION	CL
		85573	1	Pilot - Failsafe	
		85500	2	Switch - 1 P1T Heat, Dehumidity (1 - Optional - Light)	
		85502	3	Switch - 2P1T Circulation, Humidity, Mechanical Refrigeration	
		85551	1	Pilot - Circulation	
		85552	1	Pilot - Heat	
		85555	1	Pilot - Mech. Refrigeration	
		85556	1	Pilot - Humidity 1	
		85558	1	Pilot - Dehumidity	
		85545	2	Relay, 1 P1T K-1, K-2	
		85710	1	Recessed Male Plug, 230V, 3 Wire	
		85632	2	Immersion Heater	
		85665	1	Single Fuse Holder	
		85666	2	Dual Fuse Holder	
		85640	1	Heat Fuse WUX	
		85647	3	10 Amp Cartridge F-94, F-95	
		85652	3	15 Amp Cartridge One Time Fuse F-3, F-5	
		85671	2	1 Amp Fuse F-97	
		85703	1	Terminal Strip	
		85528	1	Relay, 2P1T K-3	
		81135	1	Transformer	
		85659	1	20 Amp Fuse F-7	

ENR	DATE	CODE IDENT NO. 81902	W.O. NO.		PL

APPENDIX IV

PAGE _____

DWN	REV.
DATE	ECN
CKD	BY
DATE	DATE
APVD	APVD
DATE	DATE

ASSOCIATED ENVIRONMENTAL SYSTEMS

SUBSIDIARY OF KIDDE, INC.

KIDDE AMESBURY, MA

PAGE ____ OF ____

PL

TITLE STANDARD HUMIDITY SYSTEM

MODEL BHD-408

ITEM NO.	SIZE	PART NO.	QTY	PART NAME/DESCRIPTION	CL
		85842	1	Shut Off Valve	
		85838	1	Strainer	
		85077	1	Regulator	
		82204	1	Regulator Mounting Bracket	
		85078	2	Solenoid, Fill & Drain	
		85924	1	Float Tank	
		101742	1	Vapor Generator	
		85086	1	Valve, Generator Drain	
		86409	1	Conn. ¼" Poly x ¼" MPT	
		86413	2	Conn. ¼" Poly x 1/8" MPT	
		86440	1	Elbow, ¼" Poly x 1/8" MPT, 90°	
		86459	1	Bulkhead Union, 3/8" Poly Flow	
		86463	2	Union Tee, 3/8" Poly	
		86464	1	Elbow, 3/8" Poly x 1/8" MPT	
		86259	4'	Nylo Seal Tubing 3/8" Dia.	
		86417	4'	Nylo Seal Tubing, ¼" Dia.	
		82083	8"	Stainless Tube 3/8" Dia.	
			1	Clamps, S/S	
			1	Hose, 2¼" Long Piece, ½" I.D.	
			1'	Copper Tube, ¼" Dia.	
			3'	Copper Tube, 3/8" Dia.	

ENR	DATE	CODE IDENT NO. 81902	W.O. NO.	PL

DIMENSIONS IN INCHES

DO NOT SCALE PRINT

ZONE	LTR	REVISIONS	DATE	APPROVED
		ORIGINAL ISSUE SYMBOL A		

NOTES:

ALL TUBING TO BE 'IMPERIAL-EASTMAN NYOSEAL' CLEAR TYPE ONLY UNLESS SPECIFIED OTHERWISE.

LIST OF MATERIAL

G2 G1 GROUP NO QTY	PART OR IDENTIFYING NO.	DESCRIPTION	CODE IDENT.	SPECIFICATION	MATERIAL	UNIT WT.	ITEM NO.

UNLESS OTHERWISE NOTED TOLERANCES			
BASIC DIM	FRACTIONS	DECIMALS	ANGLES
0 THRU 6	± 1/64	± .005	± 1°
6 THRU 24	± 1/32	± .010	
OVER 24	± 1/16	± .015	

ALL DIMENSIONS INCLUDE PLATING

DRAFTSMAN	S. KIM
DATE	4/21/87
CHECKER	
VERIFIED M. E.	
VERIFIED E. E.	
APPROVED	

MATERIAL SPECIFICATION

DESIGN ACTIVITY APPROVAL

FINISH TEMPER

OUTSIDE APPROVAL

NEXT ASSY | USED ON

APPLICATION

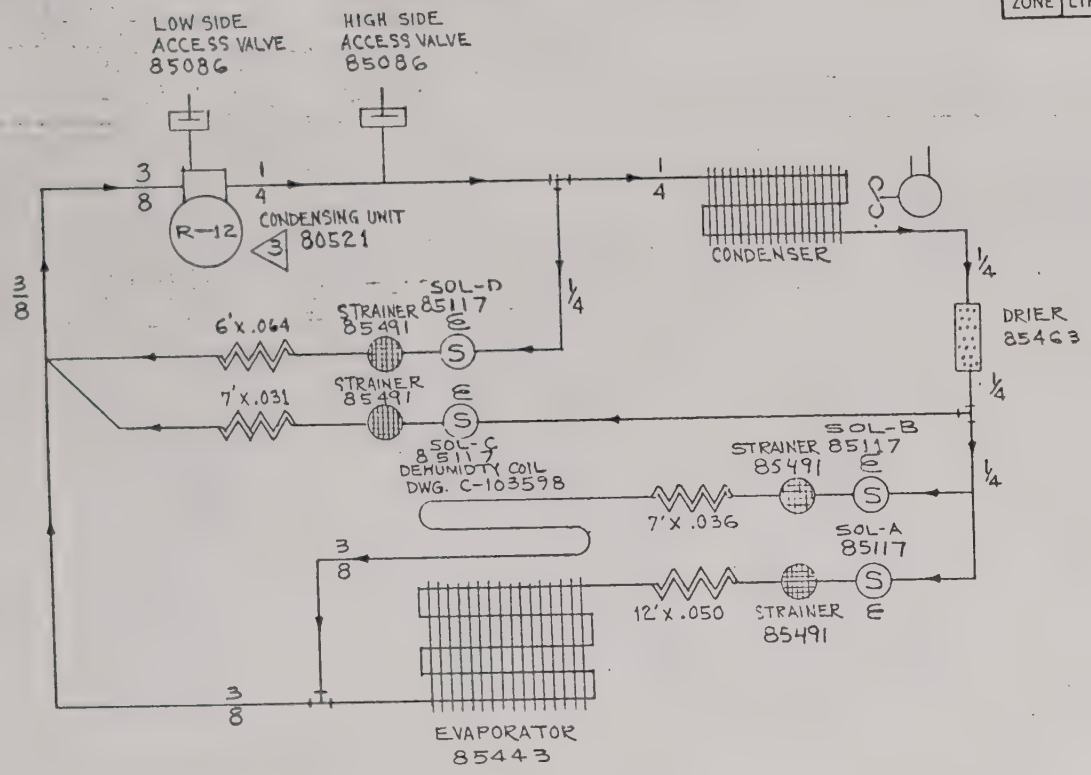
Craig Systems Corp. LAWRENCE MASSACHUSETTS

VAPOR GENERATOR HUMIDITY SYSTEM
PIPING DIAGRAM FOR BHD-408
W/OPTIONAL WATER
RECYCLING SYSTEM

SIZE	CODE IDENT. NO.	DRAWING NUMBER	ISSUE
C	81902	C-107544	A

SCALE | CALC. WEIGHT | SHEET 1 OF 1

REVISIONS		ORIGINAL ISSUE SYMBOL A		
ZONE	LTR	DESCRIPTION	DATE	APPROVED



SEE P/L 107545

NOTES:

1. INSULATE ALL RETURN LINES WITH ½" THK. "ARMAFLEX".
2. USE REFRIGERANT R-12 ONLY.
3. REMOVE RECEIVER FROM THE 80521 CONDENSING UNIT.

NEXT ASS'Y	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS DECIMALS ANGLES

ENGINEER		
CHECKED		
PREPARED	S. KIM	4/24/87
DESIGN ACTIVITY APPROVAL		
OUTSIDE APPROVAL		

Craig Systems Corp. LAWRENCE, MASSACHUSETTS

REFRIGERATION PIPING SCHEMATIC FOR BHD-408

SIZE	CODE IDENT. NO.	
B	81902	B107545 A
SCALE		SHEET 1 OF 1

OCC' 047

DWN S.KIM	REV. A	ASSOCIATED ENVIRONMENTAL SYSTEMS	PAGE 1 OF 1
DATE 4/28/87	ECN	SUBSIDIARY OF KIDDE, INC.	PL 107545
CKD	BY	KIDDE AMESBURY, MA	TITLE REFRIG. SCHEMATIC
DATE	DATE		MODEL BHD-408
APVD	APVD		
DATE	DATE		

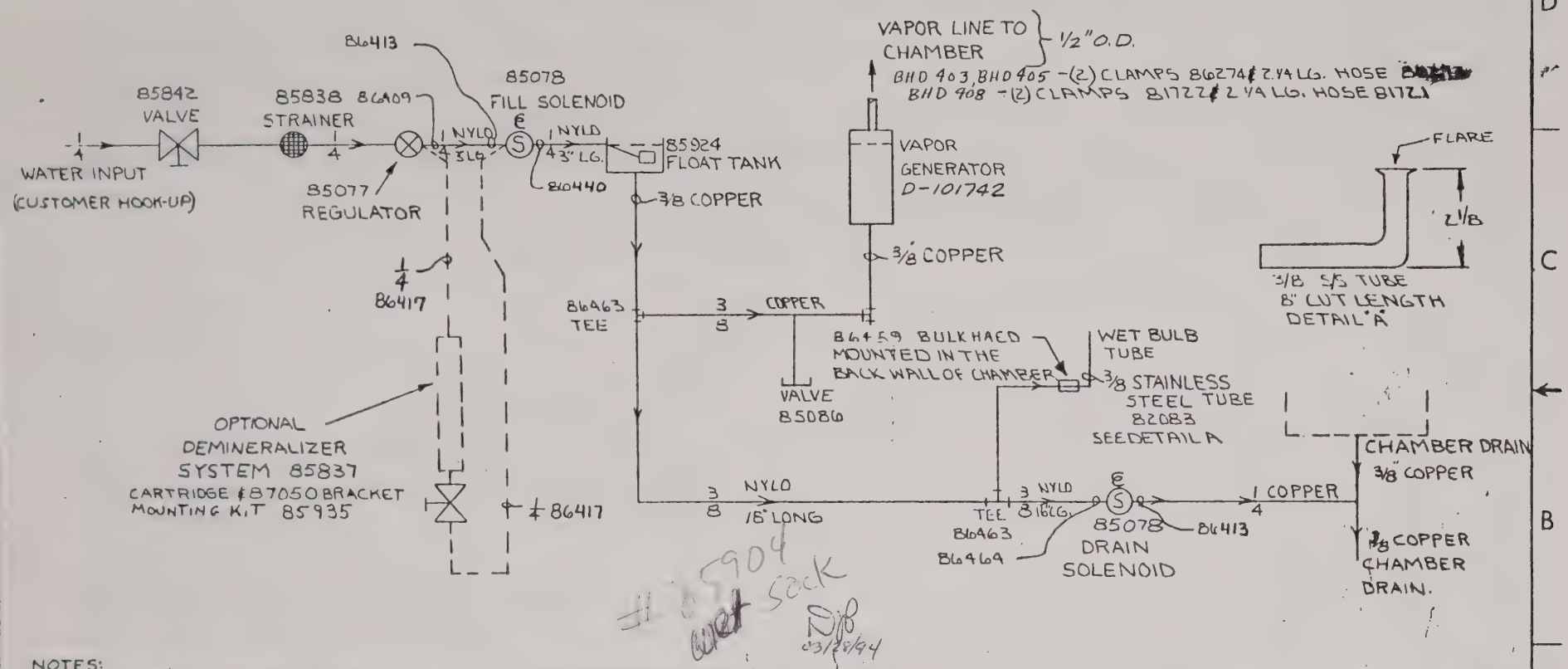
ITEM NO.	SIZE	PART NO.	QTY	PART NAME/DESCRIPTION	CL
	–	85086	2	ACCESS VALVE / LOW, HIGH	
	–	80521	1	CONDENSING UNIT	
	–	85491	4	STRAINER	
	–	85117	4	SOLENOID VALVE	
	–	85463	1	DRIER	
	C	103598	1	DEHUMIDITY COIL	
	–	85443	1	EVAPORATOR	
	–	85482	6'	CAP TUBE .064 I.D.	
	–	85477	7'	CAP TUBE .031 I.D	
	–	85479	12'	CAP TUBE .050 I.D.	
	–	85495	7'	CAP TUBE .036 I.D	
	B	107545	–	REFRIGERATION SCHEMATIC	

ENR	DATE	CODE IDENT NO. 81902	W.O. NO.	PL 107545

APPENDIX V

PAGE _____

REVISIONS			ORIGINAL ISSUE SYMBOL A		
ZONE	LTR	DESCRIPTION		DATE	APPROVED



#5904 wet sock DJP 03/28/94

NOTES:

ALL TUBING TO BE 'IMPERIAL-EASTMAN NYLOSEAL' CLEAR TYPE ONLY UNLESS SPECIFIED OTHERWISE.

NEXT ASS'Y	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS DECIMALS ANGLES

ENGINEER		
CHECKED		
PREPARED	S. KIM	4/21/87
DESIGN ACTIVITY APPROVAL		
OUTSIDE APPROVAL		

Craig Systems Corp. LAWRENCE, MASSACHUSETTS

VAPOR GENERATOR HUMIDITY SYSTEM PIPING DIAG. FOR BHD-403, BHD-405, BHD-408

SIZE	CODE IDENT. NO.		
B	81902	B107542	A

SCALE | SHEET

DWN	REV.
DATE	ECN
CKD	BY
DATE	DATE
APVD	APVD
DATE	DATE

ASSOCIATED ENVIRONMENTAL SYSTEMS

SUBSIDIARY OF KIDDE, INC.

KIDDE AMESBURY, MA

PL

TITLE HUMIDITY SYSTEM OPTION

MODEL BHD-408

ITEM NO.	SIZE	PART NO.	QTY	PART NAME/DESCRIPTION		CL
				Optional Demineralizer Cartridge System		
		85837	1	Demineralizer Cartridge		
		87050	1	Mounting Bracket		
		85935	1	Mounting Kit		
		86417	2'	Nylo Seal Tubing, ¼" Dia.		
				Optional Recirculating System		
		85884	1	Plastic Tank & Cover		
		85904	1	Float Valve		
		85763	1	Condensate Pump		
		86448	2	Bulkhead Union, ¼" Poly		
		86459	1	Bulkhead Union, 3/8" Poly	Mounted in Tank	
		86440	1	Elbow, ¼" Poly x 1/8" MPT, 90°	Delete 86413 from standard	
		86259	8'	Nylo Seal Tubing, 3/8"		

ENR	DATE	CODE IDENT NO. 81902	W.O. NO.		PL

APPENDIX VI

PAGE _____

DWN	REV.
DATE	ECN
CKD	BY
DATE	DATE
APVD	APVD
DATE	DATE

ASSOCIATED ENVIRONMENTAL SYSTEMS

SUBSIDIARY OF KIDDE, INC.

KIDDE AMESBURY, MA

PL

TITLE

MODEL BHD-408

ITEM NO.	SIZE	PART NO.	QTY	PART NAME/DESCRIPTION		CL
		85750	1	Motor, 6-5/8" Shaft, 115v, 50/60 Hz		
		85125	1	Motor Mount, 3-3/8"D		
		85171	1	Fan Blade 8"D		
		85172	1	Fan Guard		
		85175	2	Hinge		
		85182	1	Handle		
		85184	1	Latch-Large		
		85186	1	Strike		
		85237	9'	Door Gasket - Silicone 1' x 3/8		
		86016	1	Flanged Tube 2-1/8"D x 3½"		
		86033	1	Speednut 2-1/8"D		
		85223	1	2-1/8" 'O' Ring		
		86039	1	Port Plug, 2"D - Black Neoprene		
		85254	1	Window - 9x9x4 Panes		
		85212	1	Window Gasket 9x9 Outside		
		85216	1	Window Gasket 9x9 Inside		
		82358	32	8/32 - 3/8" Lg. Phillip Head Screw	Electr. Mtg. Panel	
		82253	12	½-20-5/8 Lg. Bolt	Door	
		82345	20	10/32-½"LG Pan Head Screw	Door, Electr.Mtg.Panel	
		82346	18	10/32-½" LG Pan Head Screw	Door, Electr.Mtg.Panel	
		82376	80	8-Sheet Metal Screw	Electr.Mtg.Panel, Back & Side Panel	
		82279	8	8/32 Keeper Nut	Instr.Panel,Electr.Mtg.Panel	

ENR	DATE	CODE IDENT NO. 81902	W.O. NO.		PL

DWN	REV.
DATE	ECN
CKD	BY
DATE	DATE
APVD	APVD
DATE	DATE

ASSOCIATED ENVIRONMENTAL SYSTEMS

SUBSIDIARY OF KIDDE, INC.

KIDDE AMESBURY, MA

PL

TITLE

MODEL BHD-408

ITEM NO.	SIZE	PART NO.	QTY	PART NAME/DESCRIPTION		CL
		82280	12	10/32 Keeper Nut	Instr.& Electr.Mtg. Panel	
		82365	4	#10 Flat Washer	Electr. Mtg. Panel	
		82295	4	8/32 Lock Washer	Electr. Mtg. Panel	
		82252	16	¼ Lock Washer	Electr. Mtg. Panel Door	
		82305	2	#10 Flat Washer	Electr. Mtg. Panel	
		82252	6	¼-20 Lock Washer	Electr. Mtg. Panel	
		82306	2	¼-20 Flat Washer	Electr. Mtg. Panel	
		82342	4	¼-20-½"Lg Bolt	Electr. Mtg. Panel	
		82244	2	¼-20-1⅓ LG Bolt	Compressor	
		82253	2	¼-20-5/8 LG. Bolt	Electr. Mtg. Panel	
		82281	4	¼-20 KEP Nut	Compressor	
		82332	8	¼-20-1" LG Phillip Head Screw	Instr. Panel	
		82319	56	AD-44 Pop Rivet	Condenser, Evaporator, Window	
		82296	14	10/32 Lock Washer	Door	
		82281	4	¼-20 Keeper Nut	Door	

ENR	DATE	CODE IDENT NO. 81902	W.O. NO.	PL

APPENDIX VII

PAGE _____

RELATIVE HUMIDITY TABLE

35° TO 210° FAHRENHEIT

| DRY BULB READING °F | DIFFERENCE BETWEEN WET AND DRY BULB READINGS DEG. FAHR. PRESSURE 30". | | |

PERCENT RELATIVE HUMIDITY
FOR DRY BULB TEMPERATURES OF 0 TO 100° C

| WET BULB DEPRESSION PSYCHROMETRIC DIFFERENCE (DEGREES C.) | | |

APPENDIX VIII

PAGE _____

WARRANTY POLICY

Associated Environmental Systems, a Division of Craig Systems Corporation, warrants this product to be free from defects in material and workmanship, provided the same is installed, maintained, and operated in accordance with current instruction manuals.

This warranty is limited to the replacement and/or repair only of such defective part(s) as authorized in writing, provided examination by Associated discloses such defect upon its return to Associated, with transportation charges and costs prepaid by the purchaser.

Associated's responsibility under this warranty shall be limited to the following:

1) Mechanical refrigeration systems shall be warranted for a period of ninety (90) days from date of shipment and shall cover repair or replacement of said systems F.O.B. Associated's plant in Amesbury, Massachusetts.

2) Mechanical refrigeration systems, after the initial 90-day coverage, shall be warranted for an additional period ending one year from the date of shipment but shall cover material cost(s) only for repair or replacement of said system with a similar system, F.O.B. Associated's plant in Amesbury, Massachusetts.

3) This warranty shall extend to CO_2 Chambers provided such Chambers are operated with the Associated CO_2 Scrubber and provided the Scrubber replaceable element is changed regularly in accordance with the operating manual.

4) Other component parts shall be warranted for a period ending one year from date of shipment and shall be limited to the replacement of the defective part, F.O.B. Associated's plant in Amesbury, Massachusetts. Installation costs, including labor, shall be paid by the customer.

5) This warranty policy does not extend to damage as a result of shipping. It is the responsibility of the purchaser to resolve shipping damage claims against the carrier.

Accessories and component parts not manufactured by Associated shall be warranted only to the extent of the original manufacturer's warranty.

Products which have been altered or repaired without Associated's written authorization—products which have been altered or repaired by anyone other than Associated Environmental Systems' personnel or its' authorized Associated service representative—or, products which, in Associated's judgement, have been subjected to misuse, neglect or accident may result in cancellation of this stated warranty policy. Further, losses or damages to the purchaser's personnel and/or building and equipment as a direct result of the operation or failure of the product, are excluded from this warranty. Where no warranty is extended by the manufacturer, as in the case of viewing windows and refrigerant losses, no warranty is extended or implied by Associated.

This warranty is in lieu of any other expressed or implied warranties, including any implied warranty of merchantability or fitness for a particular purpose, and of any other obligation or liability on the part of Associated. Associated does not authorize any other person to assume for it any other liability in connection with this product.

Associated reserves the right to modify its product, without imposing any obligation upon itself to do so, on products previously manufactured.

ASSOCIATED ENVIRONMENTAL SYSTEMS
Subsidiary of Kidde, Inc.
KIDDE
10 Industrial Way / P.O. Box 648 Amesbury, MA • 01913-4848 (617) 388-7242 • TWX # 710-347-0590

Model No. BHD 408 SF Serial No. 8787 Date 6-18-88

ASSOCIATED
ENVIRONMENTAL SYSTEMS

MP MASTER
MA33098

ASSOCIATED ENVIRONMENTAL SYSTEMS
Subsidiary of Kidde, Inc.
KIDDE
10 Industrial Way • P.O. Box 648 • Amesbury, MA 01913-4848 • Tel. 617-388-5662 • TWX # 710-347-0590